1998

Regional aerosol properties from satellite observations: ACE-1, TARFOX, and ACE-2 results

Durkee, P.A.

Pergamon

J. Aerosol Sci. Vol. 29, Suppl. 1, p. S1149, 1998

Printed in Great Britain
0021-8502/98 $19.00 + 0.00

REGIONAL AEROSOL PROPERTIES FROM SATELLITE OBSERVATIONS: ACE-1, TARFOX AND ACE-2 RESULTS

P. A. DURKEE[1], K. E. NIELSEN[1], P. B. RUSSELL[2], B. SCHMID[3], J. M. LIVINGSTON[4], D. COLLINS[5], R. C. FLAGAN[5], J. H. SEINFELD[5], K. J. NOONE[6], S. GASSÓ[7], D. HEGG[7] T. S. BATES[8], and P. K. QUINN[8]

[1]Naval Postgraduate School, Monterey, CA
[2]NASA Ames Research Center, Moffett Field, CA
[3]Bay Area Environmental Research Institute, San Francisco, CA 94122 USA
[4]SRI International, Menlo Park, CA 94025 USA
[5]California Institute of Technology, Pasadena, CA
[6]Stockholm University, Stockholm, Sweden
[7]University of Washington, Seattle, WA
[8]NOAA PMEL, Seattle, WA

KEYWORDS

Aerosol Optical Depth; ACE-1; TARFOX; ACE-2; Sunphotometer; Size distribution

Recent field programs designed to study aerosol properties have produced interesting contrasts across diverse regions of the globe. ACE-1 (Aerosol Characterization Experiment) observed conditions in the relatively unperturbed southern ocean near Tasmania in November-December 1995. The Tropospheric Aerosol Radiative Forcing Observational Experiment (TARFOX) observed aerosol transported of the North American coast over the Atlantic Ocean in July 1996. Most recently, ACE-2 measured the properties of aerosol from Europe and Northwestern Africa over the eastern North Atlantic Ocean in June-July 1997.

The differences between these three regions are well observed by satellite remote sensing. The Advanced Very High Resolution Radiometer (AVHRR) aboard NOAA polar orbiting satellites measure radiance in five wavelength bands - two of which are sensitive to scattering by aerosol (Channel 1 - 0.63 μm and Channel 2 - 0.86 μm center wavelengths). The spatial resolution of AVHRR is 1.1 km with an effective swath width (suitable for aerosol retrieval) of over 1500 km depending on sunglint contamination. The AVHRR instrument on a single polar orbiting satellite nominally provides one daylight view per day of every region of the globe. These characteristics offer the possibility of regional composite analysis of aerosol properties.

This presentation will focus on two objectives. First, the array of airborne, surface, and shipboard data collected during ACE-2 will be shown to validate the satellite-based retrieval of aerosol properties. Aerosol optical depth is calculated for the first two channels of AVHRR and the radiance ratio of these channels is used to parameterize size distribution properties. *In situ* measurements were made aboard the Center for Interdisciplinary Remotely Piloted Aircraft Studies (CIRPAS) Pelican aircraft and the R/V Vodyanitskiy. Analysis of aerosol size distribution, aerosol optical depth, scattering and absorption characteristics will be used to test the assumptions in the satellite retrieval algorithms.

Second, regional aerosol properties will be examined. Particular emphasis will be placed on the differences between the ACE-1, TARFOX and ACE-2 regions. Monthly composites will be shown to describe the long-term context of each experiment. Daily results will be analyzed to study sources, transport and transformation of aerosol properties. Implications for the radiative impact of aerosols on regional climate will also be discussed.